

# Enhancing Creative Productivity: A Developmental, Domain Specific Approach

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## Introduction

Identifying potential abilities of children and youth is important, but often too little effort goes into conceptualizing how to enhance and support domain specific talent once it has been recognized. This article provides a research base for exploring this problem, leading to some grounding definitions, insights from experts on dimensions of talent development unique to domains, and common threads across domains.

In 2009, the authors were awarded a grant to develop a publication in an outstanding journal (*Psychological Science in the Public Interest* [PSPI]) on the topic of rethinking giftedness and gifted education (see Subotnik, Olszewski-Kubilius, & Worrell, 2011). For the purposes of this project, we narrowed the focus of gifted education to talent development in intellectual, academic, performance, and professional domains. This allowed us to become deeply familiar with the associated psychological literature and published experts.

Following the publication in PSPI, we were joined by several psychologists with expertise in sport, child development, the arts, and the military, among others, in a Coalition for the Psychology of High Performance to produce a further review of the literature across domains. Our goals were to (a) look at how domain-specific high performance in youth is manifested, studied, measured, and discussed in academic and professional psychology; (b) study how psychology contributes to high performance; and (c) identify generalizable psychological principles of high performance that can be applied across domains.

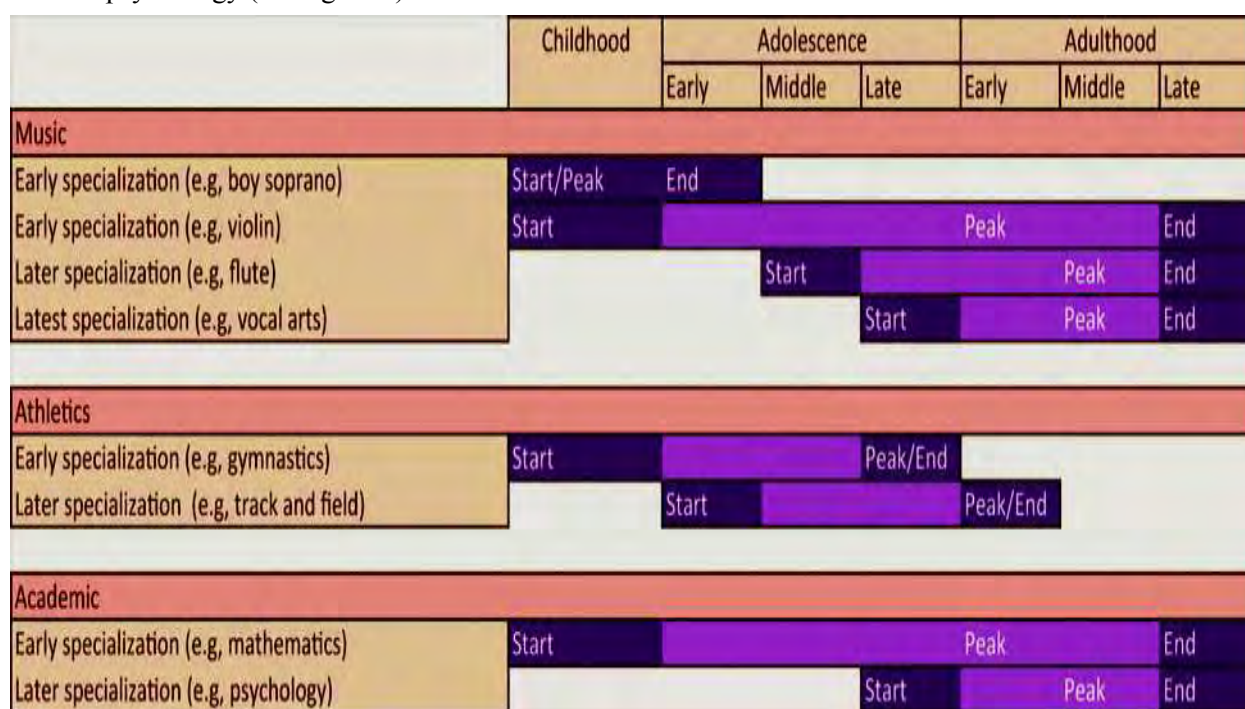
In order to better delineate our efforts at providing a developmental, domain-specific framework to enhancing creative productivity, we began by outlining some important definitions. These are presented briefly below and described in more detail in a publication entitled, *The Psychology of High Performance: Developing Human Potential into Domain-Specific Talent* (Subotnik et al., 2019, pp. 10–13).

- *Potential*: Everyone has potential for some achievement in every domain. Realistically, however, it is more accurate to say that individuals have relative strengths in some areas above others, but to qualify as abilities, these strengths must be sufficiently evident. In other words, *potential* refers to strengths, that when combined with opportunity, psychosocial skills, opportunity, and chance, are likely to lead to high performance.
- *Expertise*: This term describes a high level of competence or performance recognized by high performers in a field, and is the manifestation of developed abilities and the application of psychosocial skills, opportunity, and chance.

- *Eminence*: Eminence is used to describe individuals who have translated expertise into a singular contribution to a field that is evident to the broader society.
- *Gifted*: Gifted is the term used to describe individuals who have demonstrated potential that can be developed into expertise and maybe even eminence.
- *Talent development*: Talent development is the process of developing domain-specific giftedness into creative productivity.
- *High performance*: High performance refers to achievement within a domain at a level acknowledged by domain experts as exceptional for a particular developmental stage.

The work described in this article is based on a set of principles derived from the Subotnik et al. (2011, 2018) review. These principles referred to as the megamodel, are summarized here, and underlie all the outcomes described in later sections.

- Both general and domain-specific abilities are essential for outstanding performance, with domain-specific abilities playing an increasingly greater role as individuals move towards expertise and beyond.
- Abilities are malleable and subject to enhancement with appropriate instruction and opportunities.
- Different domains have different trajectories. That is, mathematics abilities may be identified and developed earlier than abilities in domains requiring maturity and life experience such as psychology (see figure 1)



**Figure 1:** Different domains have different trajectories

- Opportunities are most impactful when they are available at each stage of talent development.
- The availability of opportunities for talent development is a necessary component, but opportunities must be accepted and taken advantage of.
- Mental skills involve the control of fears and distractions as well as self-regulation – are teachable and increasingly important to the fulfillment of talent beyond abilities and opportunities.
- Social skills, such as the successful communication of ideas and collegiality, are teachable and, like mental skills, are increasingly important to the fulfillment of talent beyond abilities and opportunities as individuals move from achievement to expertise and beyond.

We asked our collaborating psychologists from the Coalition for the Psychology of High Performance to summarize responses to some prompts regarding the development of elite talent in their respective domains. More specifically, they provided overviews of the existing research, as well as descriptions of early manifestations of talent in the domain and the psychosocial skills that appeared to be essential for success. We also asked whether there were demarcations in the literature that were interesting for the field to explore. For example, do principles of high performance in sport remain the same whether referring to a team sport or an individual one? And is talent development in a profession that requires long and arduous formal education (e.g., medicine) similar in any way to one that does not (e.g., software engineering)?

For each domain, we probed the identification of benchmarks that indicate readiness to move to the next stage of talent development and investigated the types of inhibiting factors that get in the way of movement forward. Finally, we discussed what proportion of the responses related to identification and inhibiting factors come from research and what proportion is based on professional judgment. In the rest of this article we describe some of the findings that appear in this collection of chapters.

### **Academic domains: Psychology and mathematics**

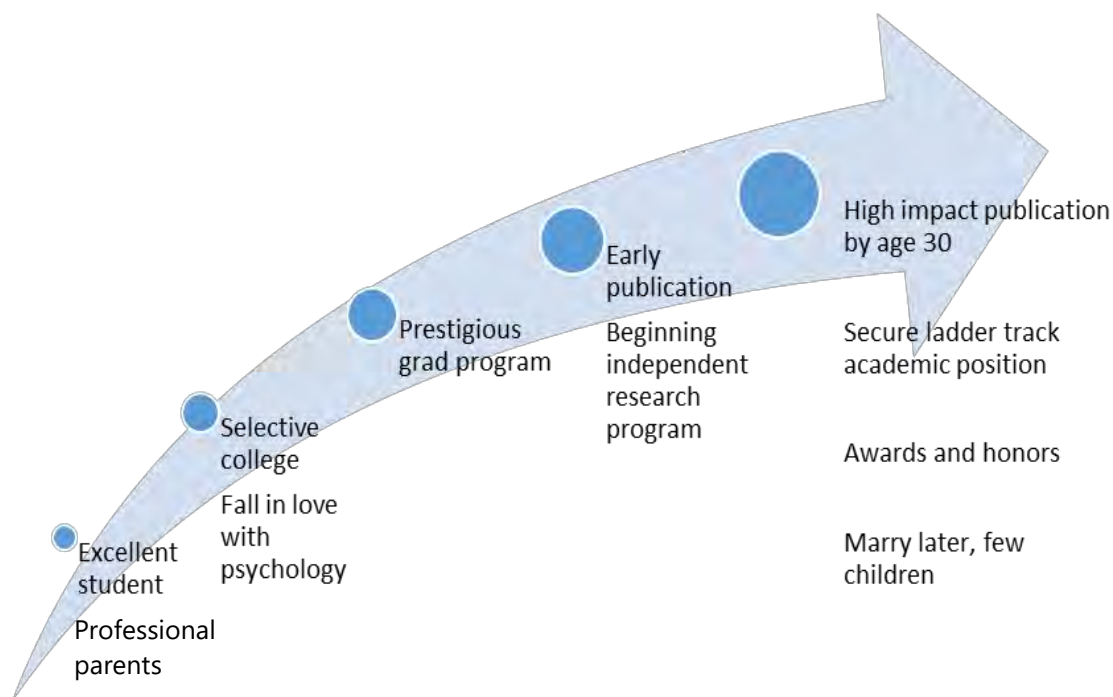
The work described in this section is derived from scholars Dean Keith Simonton (University of California, Davis) and Roza Leikin (University of Haifa). Simonton described the development of high performing research psychologists, a later starting talent trajectory, and Leikin reviewed mathematical giftedness, which, in comparison, can be identified early. In his discussion of high performance in the domain of psychology, Simonton (2019) defined the population under consideration as those who conduct research at major universities as assistant, associate, or full professors. His review of the literature starts at the beginning of an academic career to recognition for excellence in the form of publications and awards.

According to Simonton's (1992, 2000, 2002) historiometric and biographical analyses, future eminent psychologists tend to be excellent university students coming from a background that includes parents in the professional classes. They attend a selective university where they encounter and fall in love with the subject of psychology. Success in undergraduate education leads to enrollment in a prestigious graduate program where they emerge with a track record of publications and a direction for research independent of their often eminent mentor. By age 30, they will have published several high impact pieces, secured a tenure track position, and been awarded honors and other forms of recognition. In terms of personal life, they marry later and have small families.

Notably, psychology has many sub-disciplines that vary from the natural/experimental to the human/clinical science dimensions and this variation may be reflected in the degree to which specific domain or psychosocial skills are relevant. The subfields closer to natural sciences reflect more similar patterns to those of biologists, where identification of interests and abilities can be seen at a younger age, although talent may not be recognized in the form of major adult accomplishments until middle age. According to Simonton's research, some psychosocial factors are associated with outstanding achievement talent in psychology, include openness to experience, persistence, tolerance for ambiguity, risk taking, and capitalizing on strengths and minimizing weaknesses. Some of the most pressing psychological issues, perhaps requiring particular psychological strengths for all psychologists, include the lack of replication and lack of consensus feedback from reviewers that impede the progress of publications.

In contrast to the development of high performing psychologists, Leikin (2019) draws our attention to the progress of creative and gifted mathematicians. For example, one can identify number sense and mathematical cast of mind (Krutetskii, 1976) as early as pre-school. That is not to say that later developing talent is not possible, but young children with evident abilities are ripe for opportunities to engage playfully with mathematical ideas. By middle school, Lubinski (2016) and colleagues (e.g., Lubinski, Benbow, & Kell, 2014 ) have demonstrated through a series of longitudinal

studies, that mathematical reasoning abilities are good predictors for adult creativity in the form of scholarly productivity and successful patents. Finally, a special advantage for domain trajectories in mathematics that begin during the childhood years is the possibility of many educational interventions including clubs, competition, school enrichment and acceleration.

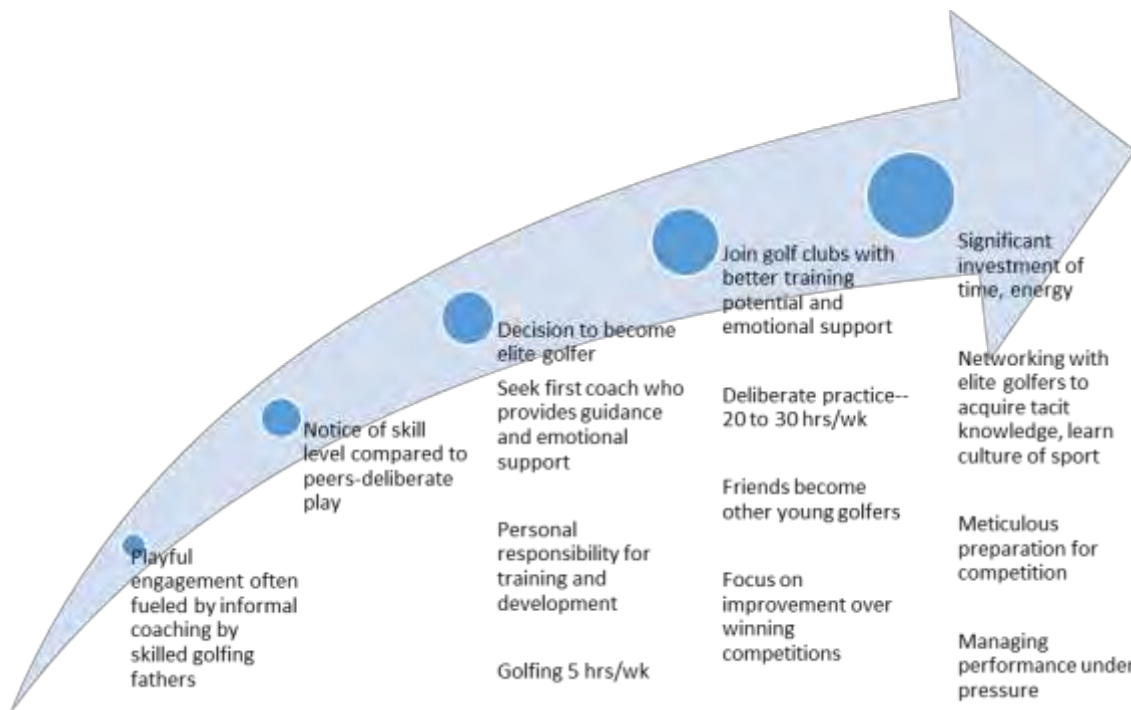


**Figure 2:** Trajectory for Eminent Psychologists

Psychology, a later starting domain, and mathematics, an earlier starting domain, share many similarities that are reflected both in the megamodel and by Bloom's (1985) work. One is the importance played by mentors, particularly in transitions from expertise to creative productivity. Great mentors provide guidance in developing good taste in research questions (Zuckerman, 1977) and in generating an original voice. Both Simonton (2019) and Leikin (2019) highlighted the importance of non-cognitive skills that assist in maintaining strength through adversity and in communicating one's ideas effectively.

### **Sport domains: Golf and team sport**

The work described in this section is derived from scholars, Steve Portenga (iPerformance), Job Fransen (University of Sydney), and Arne Gullich (University of Kaiserslautern). Portenga focused on the development of high performing athletes in an individual sport, exemplified by golf. Fransen and Gullich analyzed talent development through the lens of game (team) sports. According to the review conducted by Portenga (2019), the trajectory for high performers in golf begins with playful, informal interactions with golfing fathers. Modeling Bloom's (1985) research, this "falling in love period" generates an opportunity to notice exceptional skills. Although we often associate the precocious and prodigious Tiger Woods as the exemplar, most outstanding golfers do not specialize until their teenage years. At that time, more serious intentions to pursue golf develop and include seeking a coach other than a parent, taking more responsibility for following up on coach directives, and devoting a minimum of five hours per week to practice. Achieving expertise in golf involves joining a high-quality golf club, hence the importance of access, intensifying practice to 20-30 hours per week, and organizing social life around golf. At the highest levels, elite golfers spend the preponderance of their time on the sport: networking with other golfers and associated experts to glean any yet unfamiliar insider knowledge such as sponsorships, engaging in the types of practice needed to improve performance in competitions, and honing psychosocial skills associated with managing performance pressure.



**Figure 3:** Talent Development Trajectory in Golf

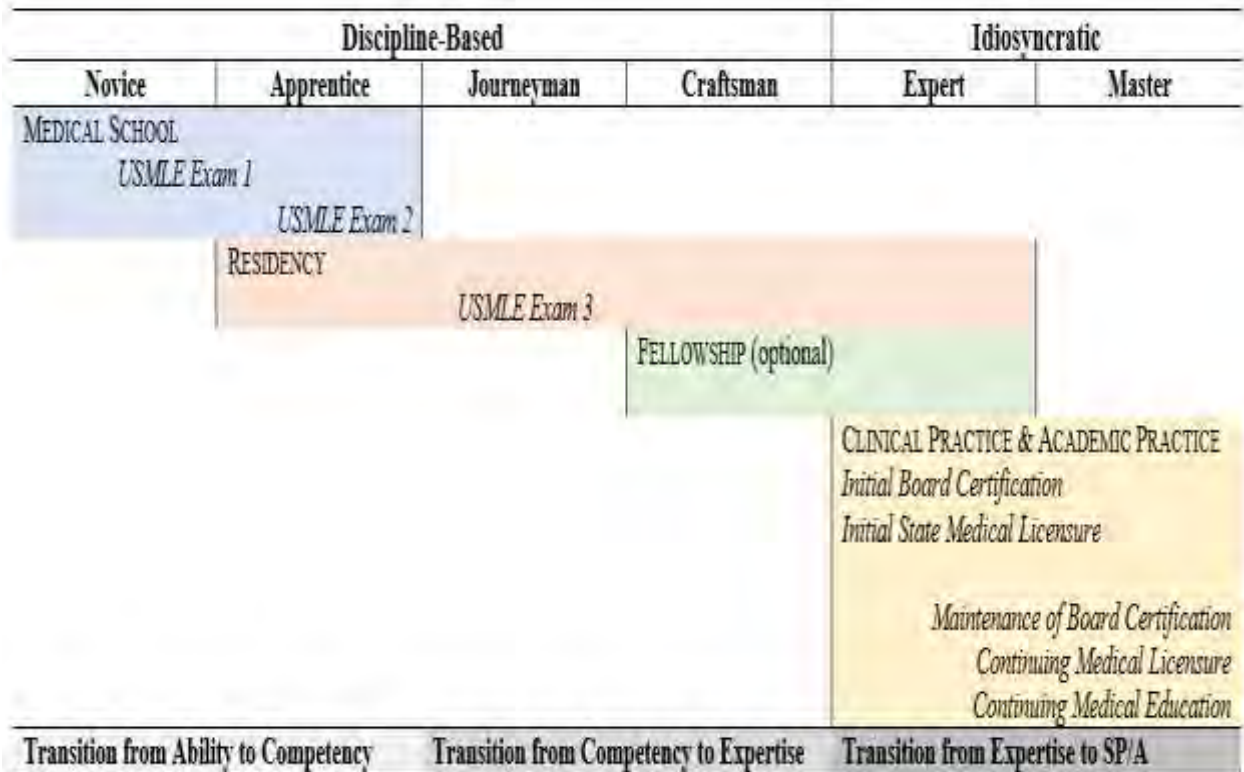
In contrast to the trajectory of development in golf, individuals talented in team sports go through several iterations of selection and deselection over time as they pass from competency to expertise and into elite levels via school or community-based playing opportunities or private clubs. What golf and team sports share runs counter to popular notions that performance as a juvenile is a predictor of senior performance. In fact, only 16% of athletes in these fields have a linear career path. More recently, experts have warned that early specialization may lead to injury and burnout and early sport diversity is preferable to build foundational athletic skills. Exceptions to this rule are in select early specialization sports, which tend to incorporate more aesthetic components, such as gymnastics, figure skating, and diving. Factors that have been shown to be essential to success in individual, team, and early specialization sports include perceptual motor skills, athleticism, deliberate practice, and psychosocial skills.

### **Professional domains: Medicine and software engineering**

This section describes a distillation of work conducted by Melissa McWilliams, Emily Holding, and Steven Knotek from the University of North Carolina (McWilliams, Holding, & Knotek, 2019). The work contrasts the long investment in education and training that is associated with medicine with the shorter and sometimes non-traditional career path taken by software engineers. Becoming a physician is a long process. If we map this process out according to developmental levels, ability is determined by way of academic prowess on a standardized test for admission to the limited number of seats available in medical schools. Additional measures considered for potential medical students are relatively new in the history of medical education, but include maintaining a work/life balance, strong organizational skills, and being able to communicate effectively with patients.

During medical school and internship, individuals must pass additional exams and compete for residency placements. During internship and residency, individuals are closely supervised, earning increasing autonomy with the demonstration of competency. The residency allows for self-selection of specialties based on interest and personality, with those wishing the least amount of patient interaction choosing, for example in pathology or radiology. Residency includes the responsibility of training others and increasing leadership responsibilities. Further specialization is acquired in the form of fellowships.





**Figure 4:** Trajectory of Medicine

Once expertise is achieved, a physician can choose from several paths, no matter the specialization. They may seek academic positions, which will entail research and expectations of leadership in the sub-specialty and within the institution. Alternatively, they can focus on clinical practice, which often involves training medical students and residents.

Psychosocial skills are needed but most are not explicitly trained. It is likely that those who continue to be successful through the long process of medical school, internship, residency, and beyond have mastered the following skills: time management, professionalism, reliability, capitalizing on strengths and making up for weaknesses, and growth mindset. Some of the other variables described in the literature include humility, empathy, persistence, and self-regulation.

In contrast to the path taken by physicians, software engineering does not require a formal degree, only mastery of programming beyond what is available academically, self-motivation, and creativity, often exhibited by engagement in independent, self-initiated projects. Once employed, the following skills become essential to success, being able to prioritize projects, learning from mistakes, managing time, working autonomously, and taking strategic risks. These are the same skills that would be needed by a high-level physician but might not be exercised so early in a career.

**Arts production: Drawing and the Culinary Arts**

In this section, we compare the progression of skills and knowledge needed for drawing (based on work conducted by Aaron Kozbelt at Brooklyn College and Andrea Kantrowitz at SUNY New Paltz) and culinary arts (Laurent Aron at FERRANDI Paris, and Marion Botella and Todd Lubart at University Paris Descartes). Both fields have long histories and many traditions that have been challenged in recent years. Unlike many less traditional domains, drawing’s developmental progression is well documented and defined, which provides a solid basis for identification of talent. Some biological markers are associated with precocity in drawing. These include non-right-handedness; linguistic deficits such as dyslexia; poor stereopsis; as well as strong visual processing, visual memory, and mental rotation. Although many young children draw for pleasure and are

encouraged at home and in school, this encouragement or availability in the school curriculum does not tend to continue into adolescence. According to Burton (1981), those who continue have what is called “ideas in search of forms” (Kozbelt & Kantrowitz, 2019, p. 317). As adults, artists continue to improve their visual cognition and processing of visual information to enhance their expertise.

In earlier eras, chefs were often servants in noble houses. Over time they achieved more independence as craftsmen. Only recently have some chefs cracked the barrier of becoming elite artists with signature dishes and approaches to food service. Aron, Botella, and Lubart (2019) laid out the path leading from entry into culinary school to master chef. Current schools that admit students to the culinary arts expect candidates to know something about the field and have had some experience working in restaurants. Once on the specialized educational path, students have the following challenges: mastering stations of increasing degrees of status in the kitchen, understanding collegiality and teamwork while also integrating “kitchen sense,” or the hierarchy that exists to make for a smooth running enterprise, dealing with problems that inevitably come up, responding with correction to failure, and finally, developing an aesthetic sensibility for lovely but highly edible food.

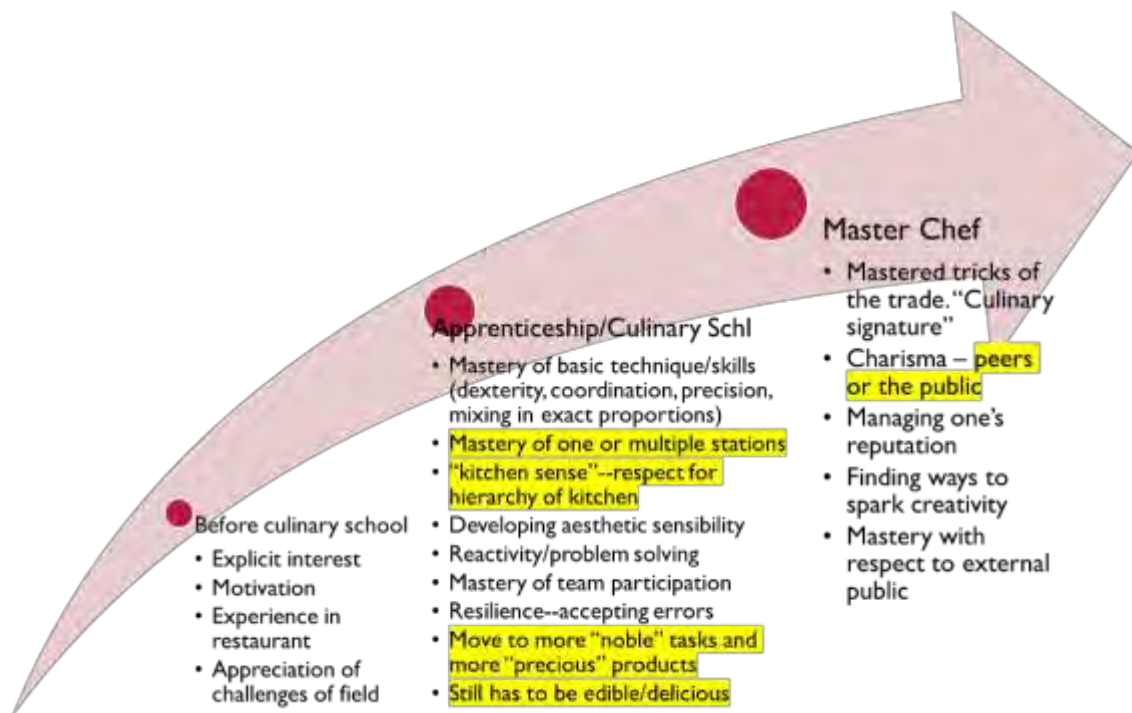


Figure 5: Trajectory of Culinary Arts

## Arts production: Dance and acting

Both dance and acting have been integral to most cultures for centuries. We compare the two art forms in terms of the role of disciplined practice and other variables that are similar and different. Joey Chua (Helsinki, Finland) studied the path of elite dancers in several countries including Singapore and Finland regarding their development and the variables most important to transition from stage to stage in their career trajectories. Tony and Helga Noice from Elmhurst College in Illinois compared acting traditions and the psychological demands that are placed on practitioners based on the philosophical orientation of their director.

Looking at similarities between the two performing art forms, we note that both have generated various training methods to develop technical skills and unique forms of artistic expression. Changes in aesthetic taste have also affected both domains. For example, in ballet, according to Chua (2019), dancers employ “little c creativity” (Kaufman & Beghetto, 2009) as they work alongside choreographers to improve the production. Contemporary dancers, however, are expected to bring original conceptions to the performance in collaboration with the choreographer. In both dance and

acting, there remain pockets of traditional practice as well as more innovative and improvisational movements.

Two interesting and notable differences between talent development in dance (Chua, 2019) and acting (Noice & Noice, 2019) are reported by our colleagues. One is the role played by deliberate practice. Noice and Noice argued persuasively that acting ability is more of an innate ability (you either have it or you do not) than is dance. According to Noice and Noice, great vocal projection, perfect diction, memorization skills, and graceful movement will rarely save the day if true spontaneity is lacking. Although dance has clearly defined domain specific indicators of potential – physical memory, body proportion, and ability to coordinate to music – the contribution of practice to dance is far more prominent than in acting. In fact, many dancers trained in gymnastics before entering the field.

## Looking across talent domains

When we revisit the principles of talent development presented at the beginning of this article, we can see that all of them play a role. What is not mentioned explicitly in the framework is the important role of creativity, particularly as a defining quality required to transition from expertise to eminence. Creativity is essential in every domain to distinguish between experts and creative producers or eminent individuals. These individuals come up with novel topics or problems to study or new methods for addressing given problems. For example, in psychology and most scholarly domains, researchers need to distinguish more important from less important problems. This is no easy feat. In fact, according to Simonton (2019), 10% of psychologists are responsible for 40% of the creative output in psychology. Creative productivity at this level requires courage, self-confidence, and concentration. Most challenging of all, creative work is not always rewarded or welcomed, and may in fact be greeted with resistance.

Domains change over time, although some very incrementally, and some, like dance, spin off more improvisational streams. Medicine used to be more privileged in team health care, with assumptions of physician leadership. More recently, work in medicine is viewed as inter-professional involving a team of experts (see Reyes & Salas, 2019). The culinary field has changed from a craft or vocational skill to one with potential for high art, even beyond the sense of taste to the visual and dramatic. And drawing, with the advent of conceptual art, once the central feature of training for novice artists (to say nothing of school children), is now viewed as optional. Instead, ideas are considered more important than the technique or media of expression.

Learning quickly and identifying patterns are extremely valued functions in each domain and have been associated with domain specific abilities – visual (visual arts and mathematics), verbal (general academic and acting), physical (dance and sport), spatial (mathematics and dance) and quantitative (mathematics and many professions such as software engineering). Some psychosocial factors appear to enhance talent development trajectories across all domains. These include being receptive to instruction, persisting whether things are going well or poorly, identifying with the domain, exhibiting self-regulation and self-confidence, taking strategic risks, and possessing good social skills. In the performance domains, charisma is particularly important, and to different degrees, knowing how to play the “game” and tasteful self-promotion are valuable skills in especially competitive arenas.

Across all domains, several factors can derail individuals with promise. Most important is giving up in the face of obstacles, difficulty, or failure. Failure to persist may be due to inappropriate mindsets, comparisons with others, or performance fears. Sometimes talented young people lose passion for a domain, even after investing in it for many years. Others whose passions might be enhanced do not receive appropriate education or coaching, leaving them stymied in their development. Tragically, some enormously talented young people cannot persist in a domain such as golf, for example, because of the financial resources involved in equipment and club membership. Finally, families or peers may dissuade a talented individual from pursuing their talent due to lack of emotional or verbal support. This may be especially true in situations where family and community



culture does not highly value a domain of performance or ideas, or where aspirations for parents of bright young people are limited to succeeding in a traditionally respected profession such as law, medicine, or engineering.

Domains where deliberate practice plays a central role, as expected, include dance, drawing, golf, some procedural components of medicine, and team sport. According to our research, fields like medicine and academic psychology appear to benefit more from guided *experience* than deliberate practice and acting requires the ability of spontaneity, which cannot be trained, according to our experts (see Notice & Notice, 2019).

From this project, we were able to deduce that domains with more research evidence include dance, drawing, golf, mathematics, medicine, and psychology. In contrast, areas that are on the research frontier of high performance psychology and a goldmine for new researchers include acting, the culinary arts, and software engineering.

Clearly domains change over time and some of the conclusions we have come to by way of empirical study or best practice may shift. We remain certain, however, that psychosocial skills will continue to play an important role in supporting success among equally talented individuals, particularly at the more advanced levels of talent development.

The field of intra and interdomain talent development is a burgeoning field with many outstanding questions to explore. We present a few of them here:

- What aspects of general intelligence are critical in the context of specific domains?
- Can one make eminent contributions in a domain without being an expert?
- What are the ideal proportions of specialization and interdisciplinarity in a domain? What are the implications of the answer for education?
- What are the most effective ways of teaching mental and social skills? Who is best suited to provide this instruction?

We hope you will join in this effort and look forward to the next iteration of the talent development field.

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